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HONOLULU, HAWAII
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TURKEY MANAGEMENT IN HAWAII

BY
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BY

C. M. Bice,* *Poultry Husbandman*

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INTRODUCTION

It is only during the past few years that much interest has been shown in raising turkeys on a commercial basis in Hawaii. During these years a number of turkeys for breeding stock have been brought in from the mainland and the future should show a decided upward trend in the business of turkey raising.

CHOOSING A VARIETY

There is just one turkey type that applies to the six varieties of turkeys that are recognized in the American Standard of Perfection. In choosing a variety, color of plumage is usually the deciding factor. However, there are breeders of each variety who claim points of superiority for their particular variety. No matter what variety is chosen, the weights are all the same except for the Bronze, which is a few pounds heavier (Table 1). The American Standard of Perfection gives the weights for the various varieties and ages of turkeys as follows:

Table 1. *Standard weights of turkeys*

Variety	Female under one year Pullet	Female over one year Hen	Male under one year Cockerel	Male between 1 and 2 years Yearling Cock	Male over two years Adult Cock
Bronze	16	20	25	33	36
Narragansett	14	18	23	30	33
White Holland	14	18	23	30	33
Black	14	18	23	30	33
Slate	14	18	23	30	33
Bourbon Red	14	18	23	30	33

* The author desires to acknowledge the assistance of F. G. Botelho, foreman of the University Poultry Division, who helped to obtain the data presented in this circular.

At present the Bronze is the most popular variety in Hawaii, followed by the White Holland and Bourbon Red. The Bronze is so named from the copperish bronze coloring on various sections of the body. In the maintail the feathers are dull black with penciling of brown running parallel across the feather. On each feather a band of bronze extends across the feather, bordered by a narrow band of black and terminating in a band of white. The back and breast of the male are a rich copperish bronze, free of white edging. The body feathers, tail coverts, main tail and fluff are edged with white. In the female, the feathers of the back, breast, body and top of wings are edged with white, while other sections are similar to that of the male. The White Holland is pure white in all sections. Those preferring white plumage will find the White Holland a quiet, docile bird, not inclined to roam great distances, and a rapid grower.

Bourbon Reds are brownish red in all sections except the long tail feathers and wing feathers, which are white. The white sections of this variety should be free of brownish red, a defect found on many individuals. Slate turkeys are colored as their name implies. The plumage has a slate or slaty-blue appearance, free of black spots. On some birds of defective color marking, black spots appear on the slaty-blue plumage. Black turkeys are a lustrous, greenish black in all sections. The under color is dull black. This variety is noted for its early maturity and also for its plump, well-formed breasts. The Narragansett is similar to the Bronze in many respects. If one can imagine a turkey similar to the Bronze except that the bronze coloring is substituted by steel gray and the edging metallic black instead of white, he will have a clear picture of the Narragansett. This variety is also especially noted for early maturity.

SELECTING THE BREEDERS

The prospective breeders should be chosen before the flock is put on the fattening ration which prepares them for market. At this time the early maturing birds can be singled out from the slow maturing individuals, also from those showing defects of shape or color. It is a poor practice to market the large vigorous males and females and to keep the less vigorous ones for breeders.

In selecting either males or females for the breeding pen, the most important requirement is vigor or good health. No matter how perfect their markings may be, if good health or vigor is lacking, the birds should not be used as breeders. Good health is shown in the

condition of the plumage. Light feathering and a glossy surface sheen together with a bright red face and adjuncts indicate health and vigor. In the males masculinity is of great importance. A male that shows effeminate characteristics should never be used. Masculinity is shown by constant attention to the females, frequent matings and an aggressive attitude towards other males. Masculinity is also shown by early sexual and physical maturity.

The physical make-up of the bird is very important in selecting breeders. Birds of extreme length or shortness of legs should be discarded in favor of birds with legs of medium length. A medium length of shank of strong bone is desirable. Never select birds with round, short shanks. Individuals that have knock-knees, bow-legs, or an unsteady gait are undesirable as breeders. Select breeders with good feet; straight toes set squarely on the feet.

A deep chest, long, broad back and a wide heartgirth are necessary physical characteristics in good breeding stock, especially in the female.

The head is of great importance and is worthy of considerable attention when selecting the outstanding birds. A long, narrow head, with a long pointed beak indicates a bird of low vigor and poor physical make-up. Individuals with sunken eyes and hollow faces are also undesirable in the breeding pen.

Not only is it essential that the bird should qualify according to the characteristics mentioned, but it should be free from defects of color and shape and also from disqualifications. Crooked backs, crooked breast bones, split wings, and deformed beaks are all to be guarded against. Birds of poor color for the variety should be rejected; this is especially true in the exhibition flock. In the large commercial flock one is repaid for close attention to color as well as to type. The male is one-half the flock and should be chosen with the utmost care, for upon him depends the future accomplishments of the turkey raiser. One should refer to the "American Standard of Perfection" for type, color, defects, and disqualifications.

MATING THE BREEDERS

There are several methods of mating the breeders, each depending upon conditions that prevail on the farm. Where it is possible, a small mating of one male with 10 to 15 females is preferable. A good vigorous young tom may be successfully mated with more than 15 females; however, care should be taken not to have too many even

with a vigorous male. If it is not possible to use the small mating, 30 females in a pen may be mated with two males, using only one male in the pen at a time, alternating him with the other male every four to seven days. Never run two males together in a small pen because of the constant fighting and the low fertility resulting therefrom. In the large flock matings, 8 males to every 100 females gives good fertility.

Two-year-old hens mated with well developed, early maturing cockerels give excellent results. Yearling toms mated with early-hatched, well-developed pullets is also a satisfactory method of mating turkeys. Old toms that are vigorous may be mated with a few hens or early maturing, early hatched pullets. However, for best results do not run more females in the pen than the tom can take care of satisfactorily. No matter what mating methods is used, vigor must come first in the selection of the breeders.

In-breeding is undesirable in the mating of turkeys, for it has a tendency to develop a strain of birds with physical and sexual weakness. It is a good policy to introduce new blood into the flock at intervals so as to elminiate the possibility of in-breeding. Unrelated families within the same strain may be mated together if the breeding of a certain family is approaching in-breeding. Line breeding is successfully practiced by breeders of experience.

It is not necessary to have a shelter or range house for adult turkeys under Hawaiian climatic conditions. Breeders roost in the trees throughout the entire year. If the branches of the trees are high up above the ground, roosts or boards leading from the ground to the lower limbs should be provided so that the heavy males do not injure themselves in flying to and from the tree.

The breeding pen should be protected from dogs by building a fence around the entire pen and roosting quarters. Stray dogs at times cause severe losses of turkeys on large free ranges. Where the breeding flock has unlimited range, dogs, mongooses, and other wild animals cause severe loss of eggs, poults and adult birds. Consequently, it is good management to confine the breeders in small pens during the breeding season, and to then turn them loose on the range after the required number of eggs or poults have been secured.

FEEDING THE BREEDERS

A well-balanced ration is required for egg production, fertility and hatchability. Weak poults are often the result of poor feeding

previous to and during the breeding season. The essentials of a good ration are carbohydrates, proteins, fats, minerals and vitamins in the proper proportions. Turkeys need a ration consisting of the above nutriments if good egg production is expected.

In Hawaii, where commercial feeds are used almost exclusively, the turkey raiser finds little difficulty in securing well-balanced feeds. The feeding method for breeders at this Station is as follows: dry egg mash in hoppers is available to the birds at all times (Fig. 1);

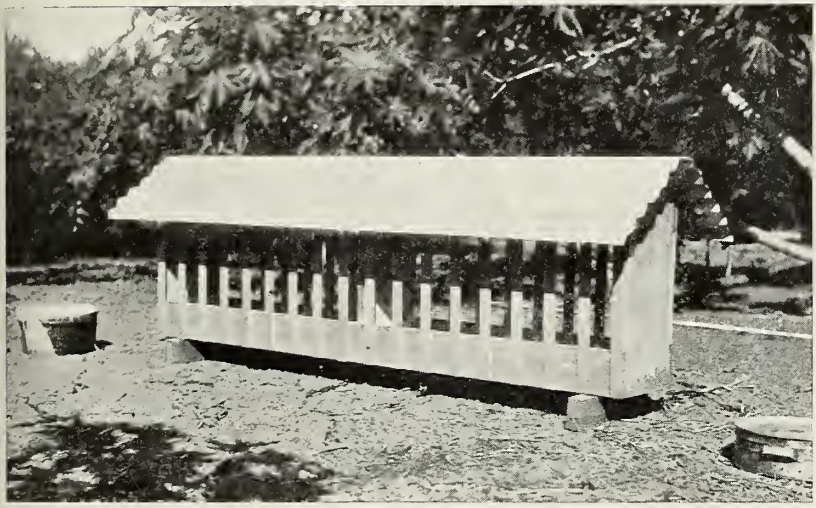

Fig. 1. Out-door feed hopper, milk and water containers for turkeys on range.

as much scratch feed as they will clean up before roosting time is placed in open hoppers at 4 p.m. (no feed is fed on the ground); semi-solid buttermilk appears before the birds all day, the mixture being 1 part semi-solid buttermilk and 9 parts water; fresh green alfalfa is fed once a day in addition to the greens obtainable in the breeding pens; minerals in the form of oyster shell, poultry bone, grit and charcoal are fed in open hoppers; fresh, clean water is always available. During the laying season, 1 per cent of refined cod-liver oil is fed in every 100 pounds of mash. In the all-mash ration, no scratch grain is given at any time. A fermented yeast mash is fed at noon.

Before the breeding season begins, the ration is similar to the laying ration except for a few changes. The milk is discontinued and

the protein of the laying mash reduced by adding 20 pounds wheat bran to every 80 pounds egg mash. The cod-liver oil is omitted from the mash at this time. All other feeding practices remain the same as for the laying period.

INCUBATION

Turkey eggs may be hatched by means of chicken hens, turkey hens, muscovy ducks or incubators. If chicken hens are used, 8 or 10 eggs may be safely given to the average-sized hen. Turkey hens can cover from 15 to 18 eggs, depending upon the size of the hen, and a muscovy duck can cover from 12 to 15 eggs satisfactorily.

Artificial incubation is the preferred method for commercial turkey raising, because of the number of eggs that are required for each sitting and because of the saving in labor. All the poults are hatched by artificial means at this Station. The following data were taken from experimental trials conducted to determine the proper temperature and moisture conditions for Hawaii.

After several trials, in which a study was made of incubator temperatures for hatching turkey eggs, we recommend these temperatures: First 10 days, 101° F.; from the eleventh to the eighteenth day, 101½° F.; and 102° F. for the remaining 10 days. In using these temperatures, our hatches of the fertile eggs remaining after the test on the tenth day have been high.

Equally important with temperatures is moisture. As a result of our study on moisture requirements under Hawaiian conditions, the following method of procedure is offered: No moisture is added to the incubator until the fourteenth day of incubation if the air-cell has enlarged in the proper manner. However, if the air-cell is too small on the fourteenth day, the moisture is withheld and the ventilators opened wide so as to permit a greater circulation of air within the incubator. This increased ventilation should enlarge the air-cell by the twenty-first day, at which time moisture may be added. From the fourteenth to the twenty-sixth day, if the air cell is the proper size, the eggs are sprinkled daily with warm water. In the case where moisture is added on the twenty-first day, the eggs are sprinkled daily up to the twenty-sixth day. On the twenty-fifth day, burlap sacks that have been dipped in hot water are placed in the nursery. On the twenty-sixth day hot water is again sprinkled on the burlap

sacks. The poults are not permitted to fall to the nursery tray under this method of incubation.

The eggs are turned twice daily up to the twenty-sixth day and are cooled only for the length of time it takes in turning them.

BROODING MANAGEMENT

In using the natural method of brooding, the turkey hen is superior to the chicken hen. She can take care of approximately 20 poults with excellent results. Too many poults under the hen will cause overheating, followed by severe losses. The turkey mother should be confined in a coop large enough for her to move about in comfort. The front of the coop may be so constructed so as to allow the poults to go in and out at will. The best place for the coop is on ground that is free of tall grasses or weeds and where shade is available. Pigeon peas not only make a desirable shelter for the brood coop but later may be harvested by the growing birds. Make the coop mosquito-proof at night as protection against turkey pox.

When weather conditions are favorable, the mother may be turned out with the poults after the first week. Care should be exercised so that the poults do not become chilled by damp grass or sudden showers. Under certain conditions it may be advisable to confine both the mother and poults in a brooder house to which is attached a run made of either one-half inch hardware wire or concrete, for a period of from 6 to 8 weeks, and then transfer them to a clean range.

Lice are one of the greatest enemies of turkeys brooded naturally. While sitting, the turkey mother and nest should be dusted with a good lice powder once a week in order that she may be free of these pests at hatching time. Sodium fluoride or pyrethrum powder is a satisfactory lice powder. Use pyrethrum powder on young poults or mother hen while she is brooding the young poults. Sodium fluoride may be applied to the hen while sitting.

ARTIFICIAL BROODING

After several experimental trials of different methods of brooding poults, artificial brooding has proven to be practical and economical. Diseases are more readily controlled or prevented due to close supervision of the flock. Brooding mortality has also been greatly reduced. Improved feeding methods are put into practice more efficiently and economically. Environmental conditions can be closely

watched and adjustments made so that the poults develop under sanitary and healthful surroundings.

For the first 24 hours after hatching, the poults remain in chick boxes as a "hardening off" process. Then they are transferred to a 10 by 12 foot brooder house. Not more than 100 poults should be placed in a house or in one feather battery-brooder. Attached to the house is a 10 by 20 foot run with either a concrete floor or a hardware wire floor of one-half inch mesh. Electric brooders with a 42-inch diameter for 100 poults are used exclusively. Heat is required for from 6 to 8 weeks, depending upon weather conditions. The house and run are made mosquito-proof to prevent turkey pox.

The brooding temperatures for poults are the same as those for chicks (Table 2). After the fourth week the roosts are set in place and by the fifth or sixth week the poults should be roosting without heat, except on nights that are cooler than usual. Reduce temperature gradually by raising the hover each week (Table 2). All poults are vaccinated to set up immunity against turkey pox.

TABLE 2. *Brooding temperatures for poults*

Time in Days	Temperatures in Fahrenheit
First day	100°
Second day	99°
Third day	98°
Seventh day	95°
Fourteenth day	90°
Twenty-first day	90° (Hover 9 inches from floor)
Twenty-eighth day	85° (Hover 12 inches from floor)

Pigeon peas and alfalfa provide green feed and shade for the developing poults. A range shelter provides protection against winds and rains until the young poults are fully feathered and are roosting in the trees (Fig. 2).

BATTERY BROODING

Considerable research has been done at this Station on the brooding of poults in feather battery brooders. The feather brooder has

given excellent results when a 16-candle-power carbon electric globe was placed in each compartment. A lower mortality resulted from the added warmth.

The poults were removed from the battery at five weeks and transferred to the brooder house and given the same management as those that were started in the brooder house under electric brooders.

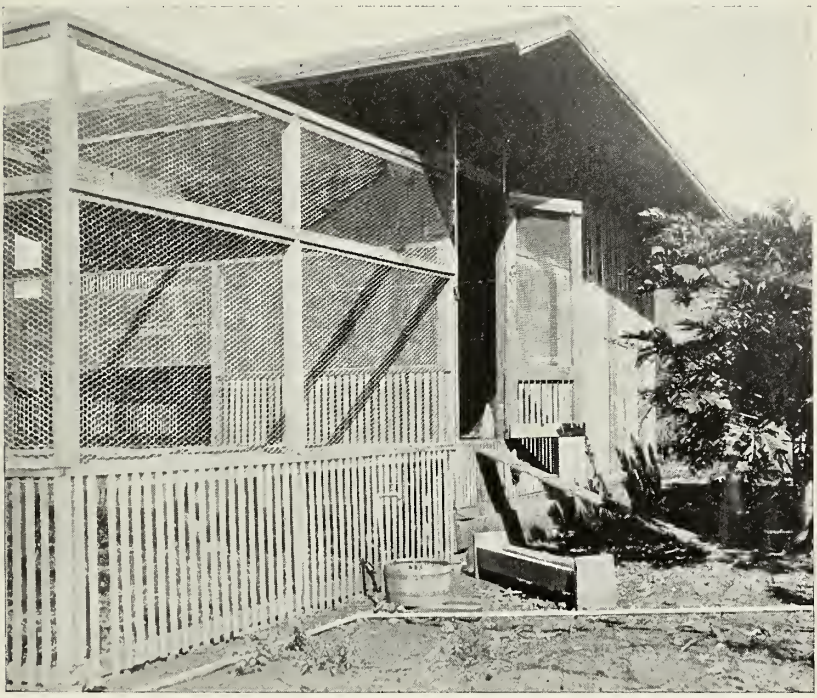

FIG. 2. Side view of turkey shelter in the direction of the wind. The opposite side of the house is entirely of lath construction. The floor of house and run is made of three-quarter inch mesh hardware wire.

FEEDING POULTS

The all-mash or the mash and scratch method of feeding poults have given satisfactory results. (Table 3.) Clabbered skim milk proved to be equal to either fresh skim milk or semi-solid buttermilk. Milk in any form is highly desirable and where possible should be fed. Table 3 gives the feeding schedule recommended when fermented yeast mash is fed. The schedule may be applied to the feeding of poults on dry mash throughout the growing period by disregard-

TABLE 3. *Feeding schedule for turkeys*

Age	Mash	Grain	Drink	Miscellaneous
0-24 hours	None	None	None	None
2 days to 7 days	Commercial chick mash in troughs all the time.	None	Liquid semi-solid buttermilk—mix 1-9	Granite grit, oyster shell (chick size). Green feed mixed with wet mash* morning and night.
2nd week	Same as above	None	Semi-solid buttermilk fed in paste form. Water	Same as above
3rd week	Same as above	Small amount of commercial chick scratch	Same as above	Same as above
4th to 5th week	Same as above	Same as above	Same as above	Same as above
6th to 13th week	Change gradually to commercial growing mash	Give a little more pullet scratch	Same as above	Same as above
14th to 40th week	Commercial growing mash	Same as above	Same as above	Wet mash* once a day at noon — green feed, shell, grit and bone.
40th to 42nd week	Gradually change to commercial egg mash	Commercial scratch feed	Same as above	Same as above
After 42nd week	Commercial egg mash	Same as above	Same as above	Same as above

* Wet mash fed as fermented yeast mash.

ing the wet mash recommendations, and also when clabbered milk is fed in place of the semi-solid buttermilk.

In feeding the all mash method under Hawaiian conditions it is well to follow the direction of the feed manufacturer.

How to Feed Fermented Yeast Mash. Add one per cent of yeast to the dry mash, then mix thoroughly. To this yeast-mash mixture add water so that a wet mash, similar to that given to chickens, is attained. Pour this mixture in a wood barrel and allow to ferment for 18 hours. Once a day feed what the poults will clean up in fifteen to twenty minutes. Remove any wet mash that remains after the above feeding period is over.

FATTENING FOR MARKET

When poults are fed according to the feeding schedule outlined in this circular, they are fairly plump at all times. (Table 3.) However, a finishing period of 30 days will put the bird on the market in excellent shape. (Table 4.) Turkeys should not be closely confined during the fattening period as they have a tendency to go "off feed" and consequently to lose weight rather than to put on weight.

TABLE 4. *Average weights of poults in ounces from one day to thirty-two weeks old.*

Age in weeks	Average weight mash* and scratch method	Average weight all mash* method
At hatch	1.8	1.8
2	4.0	3.1
4	11.5	11.9
6	22.4	28.2
8	34.0	34.0
10	53.6	54.4
12	82.0	74.4
14	104.6	100.4
16	124.0	122.0
20	174.5	171.6
24	212.8	194.4
28	244.0	233.6
32	299.5	294.6

* A fermented yeast mash was fed once daily in addition to the dry mash.

There are several methods that may be used in finishing turkeys, each depending upon the availability of the feeds and the convenience of the feeder. (1) The birds are fed whole yellow corn a month or so before marketing time. The amount fed is increased gradually until the birds are on full feed a month before they are marketed.

(2) Milk may be fed in addition to the corn. Only well-dried old corn should be used, as new corn has a tendency to cause diarrhea. In changing the feed from old corn to new, the change should be made gradually to prevent any harmful results. (3) The fattening schedule for turkeys recommended by this Station is as follows:

Fattening period: 30 days

Ration fed:

Fattening mixture	{ 40 lbs. Wheat middlings 60 lbs. Yellow cornmeal	
Scratch feed		Green feed
Whole yellow corn		Minerals
Commercial egg mash		
Semi-solid buttermilk		

Feeding Method:

1 – 14 days: Mix 40 lbs. wheat middlings and 60 lbs. yellow cornmeal. Add this mixture gradually to commercial egg mash, so that on the 14th day the ration is ¾ of the fattening mixture and ¼ commercial egg mash. Place this dry mash in hoppers where it is available at all times. Scratch feed in open hoppers appears before the birds all day. Minerals consisting of oyster shell and grit are fed in open hoppers. Green feed is fed once during the day if the range is dry. Semi-solid buttermilk, mixed 1 part of milk to 9 parts of water, is fed in wooden troughs and is readily available during the entire day.

15 – 30 days: Dry mash consisting of ¾ fattening mixture and ¼ commercial egg mash. Wet mash twice a day (morning and evening) using the dry mash mixture above fermented with yeast for 18 hours. Scratch feed in open hoppers, to which whole yellow corn has been added. Milk, green feed, and minerals same as for 1-14 days.

(4) In fattening by the all-mash method under Hawaiian conditions, follow the directions of the feed manufacturer.

(5) Rolled barley soaked in milk makes an excellent fattening food in addition to the regular all-mash or mash-and-scratch ration.

PRODUCTION COSTS

Production costs are greatly affected by the mortality rate; the higher the mortality rate, the greater producion costs will be. With a mortality of not more than 20 to 25 percent, the figures presented in this circular will be approximately the average production costs under average conditions. In presenting these figures only the feed cost is considered, and other costs such as labor, interest on the investment, equipment, insurance and minerals are not included. It is estimated that the feed cost is about two-thirds of the total production costs. Thus, if the feed cost is $2.85 (Tables 5 and 6) per bird, the total cost of production would be approximately $4.25. The feed costs as used in this circular are based on the 1934 wholesale prices.

TABLE 5. *The amount and cost of feed per poult for 6, 12, 16, 32 weeks—Mash and Scratch Method.*

Age in Weeks	6	6	12	12	16	16	32	32
Kind of Feed	Lbs. to date	Cost to date	Lbs. to date	Cost to date	Lbs. to date	Cost to date	Lbs. to date	Cost to date
Mash	3.27	.101	6.63	.197	12.50	.330	69.11	1.750
Scratch	.07	.001	.53	.010	4.14	.080	10.60	.190
Semi-solid buttermilk	1.29	.100	3.20	.250	4.06	.320	9.10	.710
Greens	.93	.005	2.35	.019	2.53	.013	40.00	.200
Oyster shell	.05	.0006	.20	.003	.31	.004	.92	.012
Grit	.07	.0007	.33	.004	.47	.007	.68	.009
						TOTAL COST		2.871

TABLE 6. *The amount and cost of feed per poult for 6, 12, 16, 32 weeks—All-Mash Method.*

Age in Weeks	6	6	12	12	16	16	32	32
Kind of Feed	Lbs. to date	Cost to date	Lbs. to date	Cost to date	Lbs. to date	Cost to date	Lbs. to date	Cost to date
Mash	3.38	0.105	6.81	.201	13.81	.397	68.81	1.927
Greens	.93	.005	2.35	.019	2.53	.013	40.00	.200
Oyster shell	.05	.0006	.15	.002	.54	.007	.84	.011
Grit	.07	.001	.25	.003	.35	.004	.60	.007
Semi-solid buttermilk	1.29	.100	3.20	.250	4.06	.320	9.10	.710
						TOTAL COST		2.855

DISEASES

Blackhead: This disease has discouraged many people from going into commercial turkey raising, and, in many instances, has

caused the failure of those who have been in the business. Recent investigations show that when turkeys run on the same ground with chickens, or upon ground that chickens have contaminated, blackhead is likely to appear. Apparently chickens do not suffer from this parasite, but are carriers who bring the disease to turkeys.

The ground is the chief source of infection; consequently, careful management plays an important part in the control of this disease. Blackhead is more readily controlled when birds are raised under the confinement or semi-confinement systems. Close attention to soil conditions is possible, thus overcoming sour or contaminated soils.

FIG. 3. Liver showing blackhead lesions (white spots) taken from a bird that died at the age of 6 months.

Symptoms: External symptoms are not always indicative of the disease. The droppings are usually a bright yellow diarrhea, but may vary from white to brown. Birds affected drink an unusual amount of water, eat very little, and are dead in a few days. The head may or may not appear dark; thus the name of the disease is not accurately associated with the symptoms.

Upon making a post-mortem, certain internal characteristics of the disease are found. The ceca, or "blind gut," is congested with a

hard, cheesy-like substance. Grayish white and yellow spots of various sizes are scattered over the liver. (Fig. 3.)

The disease may attack mature birds, but is usually confined to poults between the ages of 6 weeks and 4 months. Constant attention to the birds at this time will save worries later on.

Treatment: There is no known cure for blackhead. Various remedies have been suggested but they are of little or no help in curing the disease. One should practice preventive methods rather than attempt to cure the birds after the disease has once made its appearance in the flock.

Preventive measures consist of rigid sanitation of incubators, eggs, feed and water troughs, houses and range. In fact, everything should be kept scrupulously clean. The incubators should be washed and disinfected with a good disinfectant after each hatch. Eggs that are dirty may be washed with water, then dipped in an alcohol solution and finally dried with a cloth. This assures eggs free of disease germs, and may offset a possible infection. The feed and water troughs are sources of infection if contaminated. A good practice is to wash the troughs each day, and every other day to scour them thoroughly with boiling water. Once a week spray the troughs with a good disinfectant. A 2 per cent creoline solution is recommended. This same solution may be used for the incubators. Feed a 40 percent milk mash for one week.

Under the confinement or semi-confinement systems, the turkeys can be moved to new ground or ground that has rested for some time. By rotating the turkeys from one yard to another, the ground remains free of harmful parasites due to the constant practice of cultivation. Sunshine and air are nature's disinfectants and are the only reliable ones for soil recovery.

Visitors should not be permitted to enter the brooder houses or range unless they disinfect their shoes in a pan in which a burlap sack, soaked in strong creoline or other disinfectant, is placed. When the same individual works with the chickens and turkeys, he should make it a practice to change shoes before entering the turkey house or range. For other turkey diseases see Circular No. 5, Hawaii Agricultural Experiment Station.

PROGRAM FOR RAISING HEALTHY TURKEYS

1. Provide clean ground.
2. Keep the birds free from external and internal parasites.
3. Hatch eggs in incubators.
4. Brood the poults under the confinement or semi-confinement systems.
5. Feed a balanced ration of good clean feeds.
6. Transfer the poults from the mosquito-proof brooder house to a clean range after they are 10 or 12 weeks old.
7. Vaccinate poults as a preventive against turkey pox.
8. Do not range chickens and turkeys together, or place young poults on ground that has been contaminated by chickens.
9. Exercise rigid sanitation of yards, houses, runs, feed troughs and water troughs.
10. Do not allow visitors to enter brooder houses, brooder yards or range.